JPRS 76856

21 November 1980

China Report

SCIENCE AND TECHNOLOGY

No. 68

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PHYSICAL SCIENCES

THERMOCHEMISTRY RESEARCH TASKS OUTLINED

Beijing HUAXUE TONGBAO [CHEMISTRY] in Chinese No 1, Jan 78 p 13-15

[Article by Song Disheng [1345 6611 3932] of the the Thermochemistry Research Laboratory of Northwest University: "Some Views on the Development of Thermochemistry in Our Nation"]

[Text] Thermochemistry is part of chemical thermodynamics. Its main task is to study the patterns of change in energy in physical processes or chemical changes. When the state of matter changes, they are frequently accompanied by thermal effects. The values of thermal effects can be measured by the method of heat measurements, such as heat from combustion, melting heat, heat from solution, heat from mixtures, specific heat, absorption heat, and various types of heat from reactions. The data of these thermal effects can be used in solving questions in chemical thermodynamics and for thermodynamic functions such as the formation of enthalpy, free energy, and entropy. These can in turn be used to judge the direction of a chemical reaction and the limits of the reaction. At the same time, they also serve an important function in basic theoretical studies of material structures, physiology, geochemistry such as exploring crystalline structures, biological changed and mineral constitution. In addition, they are also important and indispensable data in thermomechanics, chemical engineering and other engineering designs. Therefore, thermochemistry is very closely related to the development of industrial and agricultural production and science and technology. It is also being applied by many industrial and technological departments of such industries as petroleum, chemical industry, metallurgy, explosives, atomic energy and aviation. Thus, although thermochemistry already has a history of development of over 200 years, it is still a very active field of study even today. Over 1,000 papers are being published in this field each year throughout the world, and an international academic publication JOURNAL OF THERMOCHEMISTRY is published. Some major industrial nations such as the United States, the Soviet Union, Japan, France and Britain have many people engaged in such research. The international society of pure and applied chemistry has also set up a committee on thermodynamics and thermochemistry. Although work in thermochemistry started relatively late in our nation, but under the guidance of the revolutionary line of Chairman Mao, a preliminary foundation has already been established. As our nation's socialist revolution and socialist construction develop, there will be greater development in this field to contribute toward the realization of the four modernizations.

Viewing the research and the trend in thermochemistry in the world at present, and combining the actual situation of our nation's socialist construction, the following aspects are worth our attention in developing our nation's research work in thermochemistry.

I. Elevate the Technical Level of Measuring Heat

The methods of measuring heat is the major method in thermochemical research. Improvement of the techniques of heat measurements is an important direction in thermochemical research. As science and technology develop, the need for thermochemical data will increase day by day and the precision and scope of measurements of the data will correspondingly be elevated. This requires ceaseless improvement and elevation of the level of techniques of measuring heat. The most important are:

1. Elevating the Precision of Measurements

Everyone knows that when using thermochemical data, data computations are frequently needed, and the error in the results obtained is directly related to the measured error of each piece of data. Therefore, elevating the precision of measurement of heat measuring meters has always been a question which has aroused much attention abroad. Especially at present, because of the widespread use of electronic computers in each department, many complex computational problems can be solved. For example, foreign nations have proposed the use of small scale experimental data in the studies of systems engineering in chemical industry to obtain large scale design data by directly computing them on the computer, thus eliminating the necessity of going through multiple levels of enlargement experiments. This greatly elevates the scientific level of designing and shortens the period from laboratory research of a product to large scale production. Therefore, experimental data (including thermochemical data) must be sufficiently accurate, and the elevation of the precision of measurement of thermochemical data, whether in the study of scientific theory or in actual production, has very important practical significance.

2. Expanding the Scope of Heat Measurements

In the past, of all thermochemical data measured, most were obtained under normal temperatures and pressures. To adapt to the development of modern science and technology, some thermodynamic data under special conditions are also needed. For example, the atomic energy industry and metallurgical industry need thermodynamic data taken under high temperatures. Low temperature engineering requires thermodynamic data taken under low temperatures. Geological research of the causes of formation of minerals also need thermodynamic data under high temperatures and high pressures. At present, foreign nations already have reported obtaining thermodynamic data under 3900K and 0.001K. Therefore, launching the work in measuring thermochemical data under high and low temperatures and high pressure is an important task.

3. Developing Techniques of Measuring Microunits of Heat

During the past 20 years, the development of the thermometer of micro-units of heat has been relatively fast. It can measure changes in the amount of heat of 10-7 joules. This is not only very necessary to the measurement of the processes of change in ordinary small amounts of heat but also is an indispensable means of measurement in the study of the changes in the amounts of heat during slow reactions and in the processes of change in biochemistry.

4. Engaging in the Study of New Methods to Measure Heat

The method of heat measurement is directly related to the measurement of thermochemical data. At present, a standard for heat measurements and some urgently needed means to measure heat must be established in accordance with the actual need in the realization of the four modernizations, such as devices to measure the amounts of heat of high temperatures and low temperatures. On the other hand, modern and advanced scientific technology must be applied to the measurement of heat as much as possible so that the methods of heat measurement can develop towards simplification, accuracy, rapidity and automation. The research and development of instruments to measure heat and record temperatures must be emphasized. They must be commercialized as much as possible for production of fixed models for popularization and application.

II. Systematically Measure Thermochemical Data

At present, the work of measuring thermochemical data in the nation lags far behind the needs in production and scientific research and a systematic study is lacking at the same time. In utilizing some thermochemical data, often they cannot be found, therefore, it is necessary to develop systematic measurements of thermochemical data. Expecially in combining our nation's present situation, the data urgently needed by the petrochemical industry, natural gas industry, metallurgy and raw materials industry, geology and national defense industries should be studied as key points.

III. Strengthen the Evaluation of Thermochemical Data

As science and technology continue to develop, there will be more and more accumulation of thermochemical data. With the ceaseless improvement in the techniques of measuring heat, the precision of the data of the same substance measured by different people or different methods will not be entirely the same. This requires compilation and evaluation of the data for reference. Foreign nations have always paid much attention to this work, there are corresponding plans and organizations and there is appropriate division of labor and cooperation and coordination. For example, The American Petroleum Association has sponsored the work of evaluation of APIRP44 numerical data continuously for over 30 years and has gathered and evaluated data on the physical properties, thermodynamic properties and spectral data of derivatives of sulphur and nitrogen related to petroleum and carbohydrates. The Soviet Science Academy has sponsored the compilation of "the thermodynamic properties of chemical substances" over 10 years. An addenda was published in 1970. It is absolutely necessary to gather and compile tables of thermodynamic data suitable to our nation's agricultural and industrial production and scientific and technological development. For several years, some production design departments have done some very precious work in this regard. In the future, there should be an overall plan, division of labor and cooperation and coordination to do this work well.

IV. Develop the Study of Thermochemical Dynamics

In recent years, the concept of thermochemical dynamics has emerged abroad. It is worth our attention. It not only studies the energy changes of a chemical reaction from the beginning state to the final state, but also studies the energy changes that reflect each stage of the reaction, and dynamic parameters are computed from these changes, for example, the progression of the reaction, active energy, frequency factors. It can be said that it is an interdiciplinary field of thermochemistry and dynamics. This is very helpful to the study of the mechanism of chemical reactions and has opened up a new realm for the development of thermodynamics itself.

V. Strengthen the Study of the Theory of Chemical Thermodynamics

Thermochemistry is a part of chemical thermodynamics. Its basic theoretical study includes the study of the theory of heat measurement. The study of the theory of chemical thermodynamics should be strengthened on the basis of practice. In recent years, because of the accumulation of spectral data and the development of statistical thermodynamics and the theory of structures, macro-thermochemistry and microstructures have been joined together, much progress has been made in the computation of thermodynamic properties of compounds using theoretical or semi-empirical methods based on molecular theory and already available experimental data. For example, the proposed method of computation of heat generated by carbohydrates has already reached the same precision of experimental data. Therefore, sufficient emphasis should be placed on the study of the theory of chemical thermodynamics, including statistical thermodynamics and irreversible thermodynamic processes.

In addition, strengthening organization of research in thermochemistry and realizing academic exchange between research at home and abroad are all significant to pushing forward the development and deepening of our nation's work in thermochemistry.

The above are some simple opinions concerning our nation's development of thermochemistry to stimulate discussion so that our nation's research work in thermochemistry can contribute towards the realization of the four modernizations under the wise leadership of Chairman Hua and the guidance of the policy line of the party's 11th Congress.

9296
CSO: 4008

PHYSICAL SCIENCES

FUTURE OF RARE EARTH CHEMISTRY IN CHINA PROJECTED

Beijing HUAXUE TONGBAO [CHEMISTRY] in Chinese No 2, Mar 78 pp 1-2

[Article by Su Qiang [5685 6973] of the Jilin Applied Chemistry Institute of the Chinese Academy of Sciences: "Development of Rare Earth Chemistry"]

[Text] Although the study of rare earth chemistry has already had over 180 years of history, a lot of time during the early period was devoted to studying the separation of single rare earth elements, because rare earth elements belong to the lanthium family of elements with very similar chemical properties. For a long time the study was limited to the application of mixed rare earth elements. It was not until 1947, when ionic exchange was used to solve the problem of separation of pure and single rare earth elements, that the research work in rare earth chemistry truly began to develop, only about 30 years ago. It can thus be seen that although people discovered and began to recognize rare earth elements a very long time ago, the research in the properties, theory and application of rare earth elements is a field with only a short history.

For the past more than 30 years, the production of rare earth elements has been greatly increased abroad because of the use of new techniques and new methods such as ionic exchange and extraction by solvents, and thus the prices have continuously dropped. In application, breakthroughs have been realized one after the other in petroleum cracking catalysts, laser materials, red fluorescent powder in color television, permanent magnetic materials and steel and iron materials. A lot of work has also been done in the study of the properties of single rare earth elements and in the study of basic theory. Thus new materials of rare earth elements have continuously emerged.

Our nation has a very rich store of rare earth resources. During the 28 years after Liberation, our nation has carried out a lot of work in geology, selection of minerals, smelting, extraction, separation, analysis and application to develop and utilize rare earth resources. Our nation's rare earth elements industry and rare earth elements work teams have been established, and they have made some achievements unique to our nation, and enabled rare earth elements to realize definite functions in our nation's socialist construction. To realize modernization of science and technology, surpass the world's advanced levels, there must be a rich scientific practice, accumulation of science and massive amounts of basic data of our own nation to summarize new discoveries, new concepts, new models, and to form a complete theoretical system to stimulate continued emergence of new techniques, new technologies, new materials, new equipment and new scientific fields.

Looking at the next 23 years in the future, there will be the following developments in the rare earth chemistry:

1. Further understanding of the electron models of the atoms and ions of the lanthium family elements, the energy levels, the structure of energy bands and the patterns of motion of 4f electrons will be gained, and from this understanding a relatively more complete theory of crystal fields of energy level splitting can be established, as well as theories of the exchange function between 4f electrons and conduction electrons, and conduction electrons, and theories of the f-f and f-d jumps between energy levels. The bonding ability and the degree of covalence of the 4f electron in chemical reactions will be understood, and the shielding effect of $5S^2 5P^6$ and the shrinking effect of the lanthium family upon the chemical and physical properties of elements of the lanthium family will be understood. There will be a further understanding of the pattern of change of the properties of lanthium family elements following changes in the atomic numbers and the position and the pattern of change of yttrium in the lanthium family. These will be compared to the elements of the actinium family having 5f electrons. This work will enrich and develop the understanding of the periodic law.

2. The fields of study of the composition, structures and properties (especially physical properties) of rare earth metals, alloys, metallic compounds, compound oxides, compound halides, sulphur family compounds, nitrogen family compounds and other compounds and their synthesis with complex compounds are still very active. During this period, as new compounds are synthesized and as the distribution of these in the two phases is studied, new separating systems of greater separating factors will emerge and the combination with new continuous and automatic multiple repetitive chemical industrial operations will produce new progress in the separation of rare earth elements. There will be discoveries of more non-trivalent rare earth elements and their compounds, and these will be used to separate and produce new materials with chemical and physical functions. The study of rare earth complex compounds will expand from oxygen containing coordination bodies to coordination bodies containing S, N, C and metallic organic compounds, from water solvents to non-water solvents, and into the realm of complex catalysis, luminescence of solvents, and inorganic organisms.

3. With the use of new techniques and new equipment of the electronic computer and automatic controls, the period for the separation, analysis and study of rare earth elements will be shortened. As the technology of extraction and separation of rare earth elements is perfected, as the cost is lowered, and as deeper understanding of massive numbers of rare earth metals and the synthesis of their compounds and their chemical, physical and biochemical properties are gained, more rare earth allow systems, rare earth catalytic systems, rare earth magnetic materials, rare earth luminescent materials, rare earth laser materials that use new wave lengths and miniaturized rare earth laser materials, new types of glass, porcelain materials and noncrystalline thin films possessing special functions will emerge.

During this period, there will be a deeper understanding of the transport properties of rare earth materials, and thus it may be possible to discover application for rare earth semiconductors, rare earth superconductors and photoelectric, thermoelectric and high temperature electric conduction of rare earth elements and solid electrolytes of rare earth elements. Rare earth elements will also serve in environmental protection and the development of new energy sources.

Expanding the application of rare earth elements is a task possessing mass character and comprehensiveness. As the knowledge about rare earth elements and the applied sciences becomes widespread in our nation, a situation of a mass character in the application of rare earth elements will be formed, thus greatly pushing forward widespread application of rare earth elements of our nation in the metallurgy of ferrous metals, metallurgy of nonferrous metals, machinery industry, petrochemical industry, glass and procelain industry, electronics, medicine, building materials, light industry, national defense and agriculture.

In the next 23 years, let us work hard to create a theory of the lanthium family and to open up the treasure of rare earth elements of great potential and wide uses. We will contribute our strength towards surpassing the world's advanced levels and towards hastening and realization of our nation's four modernizations.

9296
CSO: 4008

MISSILE ELECTRONIC SYSTEM RELIABILITY ANALYSIS DESCRIBED

Beijing GUANGMING RIBAO in Chinese 19 Sep 80 p 4

[Article by Wu Benyan [0702 2609 3508] and Chen Zhangbao [7115 4545 6283]: "Key Technology in Guided Missile Launches"]

[Text] On 18 May of this year, our country carried out its first launch of an intercontinental ballistic missile to a predetermined area of the Pacific Ocean with complete success, attracting interest both at home and abroad.

Of the many long-range missile, satellite and spacecraft launches carried out by several countries in the last 20 years, some have been successful and some have failed. Experience tells us that electronic systems reliability is the key to success in intercontinental ballistic missile launches. All countries involved in missile technology have organized large groups to carry on electronic systems reliability analysis.

Why is electronic system reliability analysis so important? There are several reasons. First, it is the result of the importance of electronic systems; an electronic system is equivalent to the brain, eyes and nerves of an ICBM. Second, it is because ICBM electronic systems are huge and complex, with many components and connections, and if just one component or connection is faulty it may put the entire electronic system out of commission. Mathematically, electronic system reliability is exponentially related to the number of components: if the number of electronic system components is increased, electronic system reliability will decrease exponentially. Accordingly particular attention must be devoted to use of reliability measures with large-scale complex electronic systems. The third reason is that the operating environment of ICBM electronic systems is extremely hostile, during the launch and during flight, the on-board electronic equipment will be subject to various stresses and dynamic loads, an environment which can very easily damage electronic components, so that the reliability requirements imposed on ICBM electronic systems are much higher than those imposed on ordinary electronic systems. Finally, as strategic offensive systems, ICBM's are expensive to produce, and they must have a very high kill rate. When missiles carry satellites or spacecraft into space, it is necessary to guarantee sufficient electronic system reliability, otherwise there may be catastrophic results. Because of the unreliability of a component costing only 2 US dollars, the 2.2 million dollar US Vanguard satellite launch failed.

There are many different ways of expressing system reliability; the most commonly used is "mean time between failures" (MTBF), which is the average duration of normal operation. For example, an MTBF of 1,000 hours means an average of about 1,000 hours without malfunctions. The MTBF of some foreign electronic devices has already reached thousands or tens of thousands of hours.

In order to assure that ICBM electronic systems will be able to work reliably within the specified launch and flight time and in a hostile environment, especial attention must be paid to overall systems operation, and a series of questions such as how to design and manufacture them must be studied. As regards design, it is necessary to solve various failure problems resulting from component damage ("damage type malfunction"), drift of component characteristics ("drift malfunction"). As a result of research by many experts, certain methods of dealing with the abovementioned failures have been developed. For example, in general less than 30 percent of the rated load of ICBM electronic system components is used, thereby greatly decreasing the component malfunction rate. Decreasing the ambient temperature for components considerably lowers the malfunction rate (each drop of 10° in the temperature cuts the malfunction rate by about half). In addition, the redundancy method is generally used to assure reliability: singly redundant components can decrease the failure rate by a third, while doubly redundant components can decrease the rate by 46 percent. In addition, it is possible to predict a component's characteristic frequency and control it so that it can withstand vibration shock during the launch or flight of the ICBM. The above are only a few methods of solving the problem of damage malfunctions. Several different methods for solving the problem of circuit characteristic drift have also been developed. For example, for circuits subject to strict requirements, the circuit parameters, or standard circuit parameter variation values can be used to figure back to permissible variations for the individual components, and the like.

Electronic system reliability technologies have their own theoretical basis. The occurrence of malfunctions is probabilistic in nature, so it is hard to make a definite prediction in advance; in mathematical terms, it is random, and the corresponding type of mathematics is probability theory. Reliability mathematics is also developing continuously. At present, the degree of reliability of ICBM electronic systems can be estimated in advance by certain methods.

8480
CSO: 4008

APPLIED SCIENCES

MISSILE TEST SHOT CARRIES CHINESE FLEET ON EPIC VOYAGE

Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 6, 1980 pp 2-5

[Article by Sun Xinhua (1327 2450 5478)]

[Excerpts] April XX Shanghai; Overcast, cloudy; Wind NW, force 5.

Today, the Wusong naval port of Shanhai is decked out as though for a festival. The dozen or so missile destroyers, escort ships, subchasers and other vessels moored at the piers sport multi-colored flags and pennants which flutter in the breeze.

At 0745 hours, Wang Zhen and Geng Biao, members of the Chinese Communist Party Central Committee and vice premiers of the State Council, Zhang Aiping, Deputy Chief of Staff of the People's Liberation Army, Li Yaowen, Political Commissar of the State Scientific and Technological Commission, Chen Guodong, first secretary of the Shanghai Municipal Party Committee, Yeh Fei, commander of the Navy, and others of the leadership, accompanied by Liu Daosheng, the fleet's commander and political officer, and Yang Guoyu, the deputy commander, proceeded to Pier No 3 to review the honor guard made up of 200 cadres and fighters. At this point, Chief of Staff Zhang Xu took three paces forward and reported: "Comrade Vice Premier, the fleet is ready. Please begin your inspection." With this, every ship blew its siren.

The party of vice premiers Wang Zhen and Geng Biao boarded missile destroyer No 131 and, escorted by a subchaser and pilot boat, they slowly made their way through a light sea to the anchorage at the mouth of the port of Wusong. In the conference room, they happily took brush in hand to write some words of encouragement for the comrades of the ship's complement, urging everyone to give a glorious account of himself in the name of naval modernization, national security and world peace.

Destroyer 131 arrived at Gaoqiao anchorage and Vice Premier Wang and the other leaders in turn reviewed the "Xiang Yang Hong No 5," the "Yuan Wang No 1," vessel No 107 and the seventeen other ships that comprised the mighty flotilla. The officers and men and the test personnel aborad the ships being reviewed stood at attention and saluted. The vice premier picked up a megaphone and a sonorous voice boomed out: "Here's to the fleet's successfully completion of its mission and to a triumphant and early return!" "Be grateful for the loving care of the leadership and resolutely carry out your mission!" The slogans rang out over the broad expanse of water.

The review of the formation was completed in an hour. Destroyer 131 returned, and, after it had docked at the pier, Vice Premier Wang shook hands with each of the fleet's commanders and saw them abroad the launch. It was not until the launch disappeared from view at the harbor entrance that the seeing-off party slowly departed. At 1020 hours the fleet received orders to weigh anchor and make toward the vast expanse of the South Pacific.

May XX Pacific Ocean; Light seas; Wind SW, force 5.

The sea is calm and there is no starlight or moonlight. The bows of the ships slice lightly through the waves. Except for the running lights on the ship's masts, the ocean is pitch black. In the command centers of the destroyer escorts there is an atmosphere of combat. The commanders pour over thier charts and check their bearings. In another hour the fleet will pass the Miyako Strait in the Ryukyu Islands. The Ryukyu Islands are situated between Kyushu, Japan and Taiwan and run in a northeast-southwest direction, separating the East China Sea from the Pacific Ocean. This island chain extends for approximately 650 nautical miles, is made up of 473 large and small islands and covers an area of 4,800 square kilometers; the islands have a population of 1.3 million people. The Ryukyu Islands are made up of the Osumi Islands, the Tokara Islands, the Amami Islands, the Okinawa Islands, the Sakishima Islands and the Daito Islands. There are numerous passes between the islands--major passageways from the East China Sea to the Pacific Ocean. The Miyako Strait is comparatively deep with an uneven sea floor. The fleet commander coolly issues orders to the warship escorts to fan out; they will open a passage for the range instrumentation ships and at the same time act as a steel curtain to protect them. Aboard each of the missile destroyers powerful missile launchers stand at the ready. Radar and sonar scan the skies above and the ocean below, watching and searching, faithfully carrying out their duty.

At the crack of daylight, the radarmen suddenly pick up a blip on the radar screen. "Target dead ahead one-five degrees, range two-oh-oh nautical miles, two aircraft." "Ding..." Battle stations sounds. The formation immediately goes into No 1 alert status. It turns out to be two Japanese MSDF reconnaissance aircraft. When they have determined that we are Chinese naval vessels they at once waggle their wings in a gesture of friendship. Our formation resumes course and passes through the Miyako Strait on its way to the South Pacific.

May XX Pacific Ocean; Scattered to dense clouds; Moderate swells, light waves.

Suddenly, the escort formation receives a message: "Probable typhoon forecast on your course for tomorrow--make typhoon preparations." The fleet commander makes the decision to have the destroyers refuel.

Refueling at sea the major way to increase the sailing duration of the warships. The duration and self-sufficiency of a destroyer are limited and if the problem of refueling at sea is not resolved, the destroyers would be incapable of leaving base for prolonged voyages into the Pacific Ocean. On this day, although the seas were slight, the ships were rolling at 10 degrees. As Vessel 107 and the oil and water supply ship X950 maneuver toward each other at a distance of 40 meters or so, the surging waves are violent and if firm control is not maintained it is easy for a collision to occur. The captain calmly orders the helm to adjust the heading and maintain [course] without deviation. At just the right moment, when the two ships are steaming side-by-side, a rocket roars off the X950 and comes down precisely in the middle of the deck of Vessel 107. Then a line is pulled over bringing with it a wire rope. In a few minutes the oil and water lines are connected and the heavy oil and fresh water flow into Vessel 107, enough for several days' steaming.

In the hours just before dawn of the second day, just as predicted, the sky over the Pacific is blotted out by dark clouds. The wind rises to force 7 and the rain thunders down. At that time, there was a tropical low pressure system over Kwajalein Island moving on the same heading as the fleet. The sea seemed to go crazy. The 20,000-ton range instrumentation ship bobbed about wildly and the missile destroyers, which only displace several thousand tons, bucked around violently, as though they had been tossed into a spindrift, their masts and antennas frequently hidden by the waves.

Actually, this kind of weather was a real test for both ships and men. The Chinese-built missile destroyers were steaming in the Pacific Ocean for the first time and the commanders and fighters they carried had much hope, spirit, and courage, for how could a weakling face the Pacific Ocean? After a month's hard sailing, not one among the several thousand seamen was seasick again. No wonder everyone says jokingly that the word "seasick" ought to be dropped from the navy's dictionary.

May XX The South Pacific; Light seas; Light breezes.

After a hard voyage of more than 3000 nautical miles, the fleet would, in half a day's time, cross the equator and enter the South Pacific! It was indeed an unforgettable moment.

In the afternoon the bridges and decks of the ships were packed with people; everyone was enjoying the exotic atmosphere of the southern hemisphere. The sea near the equator is characterized by dazzling sunshine and gentle breezes. The sky is filled with floating rosy clouds--just like holiday fireworks displays. The bright blue sky and the peaceful ocean seem as one. All at once some flying fish spring from the surface. As it turns out, the temperature here remains pretty much constant at 30 degrees C and the rising air currents create a belt 600 nautical miles wide north and south of the equator where there is no wind.

The warships continue on their voyage and at 2234 hours the fleet commander makes a startling announcement over the PA system: "In another 25 seconds, the fleet will cross the equator!" The ships of the fleet blow their sirens for a minute and the shrill blasts shatter the peaceful darkness. For a long time, the sky above the Pacific reverberates with the sound. Sailors on the decks cheer: "We've entered the South Pacific!" "We've leaped into the southern hemisphere!" The fleet command centers were even noisier. Reporters busily took snapshots of everyone for mementoes. The fleet's deputy commander carefully entered the following in the ship's log: In carrying out the mission of the launch vehicle experiment, the destroyer formation, at 1834.25 hours Beijing time, at 150°28'58" east longitude, crossed for the first time the equator and entered the South Pacific." So it was that a Chinese destroyer formation was making its first voyage in the South Pacific.

May XX At the equator, South Pacific; Moderate swells, light waves.

Perhaps an uneventful voyage is quickly forgotten but a difficult passage is imprinted on the brain of a sailor. The warships had left the East China Sea at 36° north latitude and had arrived at our launch vehicle test zone located at 7° south latitude, passing on the way Japan, the Philippines, Indonesia and Papua New Guinea. They had passed through the Ryukyu Islands, the Mariana Islands, the West Caroline Islands and the Solomons. They had stepped over the temperate zone, the subtropics and the tropics.

At midday, the blazing fireball of the sun heats the decks to more than 50°C. The engine room personnel have been below decks for less than 2 hours yet their clothes are soaked with sweat. Some of the comrades were beginning to develop sores around their mouths--the result of not having fresh vegetables for several days. Then the freezer went out and over a hundred ducks began to go bad and had to be thrown overboard to feed the fish. The supply of fresh water carried aboard ship was limited and had to be rationed. Life became hard. Faced with the intense heat, the fleet and ship party committees organized all hands to wage a war to beat the heat. Night after night they organized personnel to regulate the air conditioning equipment, changed the engine room ventilation intakes and took the appropriate steps, relying on the strength and determination of the sailors, to put an end to the ongoing oppressive heat.

May XX The South Pacific; Wind SE, force 5; Light seas.

The date for China to fire its launch vehicle is drawing near. For several days, certain countries have been dispatching warships and aircraft to our region of the ocean to conduct surveillance activities. Some of these aircraft drop sonar buoys near our ships and in order to monitor the missile's flight path to the splashdown zone, some foreign vessels conduct electronic surveillance. They also deploy antimissile warning systems.

In order not to jeopardize either our launch experiment or the safety of the foreign vessels and in order to avoid monitoring of the launch vehicle splashdown zone by the foreign aircraft and ships, the fleet commander decided that from 6 o'clock on, every ship would display the "UR" international pennant (meaning: "Stay clear, am conducting exercise").

At 0330 hours on the second day, while the sailors are fast asleep, the destroyer escort received orders to immediately conduct a sweep of an area approximately 20 nautical miles in circumference around the splashdown point and to permit all foreign vessels to exit the zone. At the same time, the command center reviewed the ocean and atmospheric conditions and decided to dispatch a group of vessels to split up and keep an eye on the foreign vessels. Concurrently, the fleet made clear the mission of each ship to safeguard and retrieve the rocket's instrument package and to take seawater samples.

"Ding..." The loudspeaker sounds battle stations. Instantly, the entire fleet seethes; the sailors race to their individual battle stations. The radar antennas spin and the sonar emits its steady pings, searching for undersea targets. After a search of almost 3 hours, they failed to turn up any target whatsoever in the splashdown zone.

But there were two foreign vessels some 30 nautical miles outside the impact point and Vessel 106 sent an advisory signal. One of the ships continued to make for the impact point. Vessel 108, without taking steps to intercept, kept sending: "Our two peoples are friendly. For safety's sake, please remove yourself from our operations area." Our goodwill advisory was understood and shortly thereafter the ship sent its second officer over to make a present of the ships insignia and a uniform cap to vessel 108. It was indicated that the Chinese Navy's advisory had been received and there was no intent to create a disturbance at sea. We reciprocated by presenting the ship with a pine bird carving from Dalian and a case of Qingdao Laoshan Beer.

Suddenly, off the port bow of Vessel 107 a dazzling red ball--like a shooting star--trailing a white plume from space came screaming down and with a thunderous roar threw up a column of water a hundred meters high. In less time than it takes to tell, the destroyer formation raced in from all around the impact zone. At the same time, the recovery vessel launches its helicopter which swoops down upon the point where the missile instrument package splashed down and hovers 30 meters over the surface of the ocean. Frogmen quickly descend a ladder and leap into the ocean. With quick and nimble movements, they take only 5 minutes 20 seconds to recover the instrument capsule. Then, from every control center and deck of every ship comes an ear-splitting shout: "The missile shot is a success." "We've done it!"

CSO: 4008

APPLIED SCIENCES

FULL-RANGE TEST OF LAUNCH VEHICLE MARKS NEW PLATEAU IN CHINA'S SPACE EFFORT

Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 7, Jul 80 pp 3-5

[Excerpts] The morning of 18 May. Visibility unlimited. A thunderous roar shakes the launch site somewhere in China. A large launch vechicle lifts off, punches through the clouds, flashes across the heavens and heads toward the South Pacific. After a 10-minute flight in outer space, it re-enters the atmosphere and splashes down precisely on the pre-arranged ocean targ t zone, successfully winding up China's first large-scale launch vehicle flight test. The success of the test demonstrates China's new advances in launch vehicle technology.

Why Flight Tests Are Conducted With a Launch Vehicle

A launch vehicle, if employed to insert a satellite or space vehicle into a predetermined orbit, is referred to as a space vehicle "carrier rocket." If it is employed to carry nuclear warheads over vast distances to destroy vital enemy targets, it is referred to as a ballistic missile. Ordinarily, a launch vehicle capable of putting a satellite into an orbit having a perigee of 300 kilometers is also capable of placing a warhead of equal weight on a target 8000 kilometers away. Correspondingly, a ballistic missile with an 8000-kilometer range is called an intercontinental ballistic missile [ICBM]. It is obvious from this that a launch vehicle and an ICBM are siblings differing only in the nature of their payloads and in the purpose for which they are used. Hence, in the design, research and development, and testing of both the launch vehicle and ballistic missile, there are many similarities. In fact, launch tests of a space vehicle "carrier rocket" are often carried out jointly with flight tests of ICBM's.

Flight tests are an indispensable part of the development of both rockets and missiles and are the final stage of the developmental work. No matter what kind of new product is being developed, extensive testing is required. The more complex the product, the more involved the tests and the more varied the procedures. Large launch vehicles and ICBM's are extremely complicated systems involving the power plants, guidance systems, and the rocket structures.

How the Flight Test of a Launch Vehicle is Organized

Large launch vehicles have ranges of 8000 kilometers to more than 10,000 kilometers. Because [most] countries have limited open spaces within their territories, full-range overland tests cannot be conducted. They must turn to the oceans, which occupy 71 percent of the earth's surface. Both the U.S. and the USSR use the Atlantic and Pacific oceans to conduct maximum range tests with their launch vehicles and ICBM's. China opted to use an open region of the South Pacific as the site to conduct its launch vehicle test. Ocean testing makes it necessary for tracking, data capsule recovery, ocean communications command, rear services support, etc., to be conducted at sea, which means many new problems for the preparation of the flight test. Both the United States and the Soviet Union, before holding maximum-range tests, first carried out a selection of the splashdown site, made hydrological, meteorological, and geological studies and devised highly accurate tracking equipment. They had to develop, modify and build anew all kinds of monitoring gear, large monitoring vessels and aircraft for ocean tracking and had to hold ocean communications tests. In addition, safety hazards can develop from mid-flight burnout and other malfunctions and this requires highly reliable safety remote control equipment.

Also, tests on the high seas can involve international shipping and air lanes and as a result, on the eve of the test, an announcement must be made declaring the date of the test and the off-limits area of the ocean. The monitoring ships and the recovery vessels must reach the designated area beforehand to prepare for the operation. Weather probe rockets are launched at the launch site and by the vessels at the splashdown zone and weather radar begins to monitor the weather and issue weather forecasts so that the launch can be made under optimal conditions. Target communications systems assure the coordination of the monitoring and communications equipment of the several hundred stations along the 10,000-kilometer route between the launch site and the splashdown zone. It is obvious that a full-range flight test of a large launch vehicle is a complicated large-scale experimental process requiring extensive preparation time, strict organization and direction, and technical coordination. It touches on many sophisticated aspects and systems of science and technology. So the successful full-range flight test of a large launch vehicle reflects a nation's level of science and technology.

Flight Test Zone and Installations

The launch is the key link in a successful flight test of a launch vehicle. If the launch isn't just right, a successful flight cannot take place.

The remote launch site has a command and control center, a communications center, a moterological installation, a data processing center and the full run of optical and readio measuring equipment for tracking and monitoring.

The command and control center provides unified command, control and coordination for the tests and the tracking and monitoring installations as well for all concerned quarters participating in the tests. The command center has the command and control stations and various display equipment.

CSO: 4008

ENCOURAGED BY SUCCESSES, CHINESE MAP OUT FUTURE SPACE PROGRAM

Beijing XIANDAIHUA [MODERNIZATION] in Chinese Vol 2 No 10, 16 Oct 80 pp 3-5

[Article: "Ten Years of Chinese Satellites"]

[Excerpts] On 24 April 1970 China launched its first satellite, the "East Is Red No 1." Chinese space technology had created a base out of nothing. In 10 years eight satellites have been successfully launched one after the other. Of special note was the successful return to earth of a satellite, demonstrating that our space technology had undergone further development. China has now established a comprehensive ground monitoring and control network, computer centers, and launch pads. We have established specific bases for satellite research and development and production and large-scale environmental experimentation. In addition, a corps of young space technicians has been forged.

Chinese Space Technology Forges Ahead

Launching a satellite requires complex and modern systems engineering, broken down into five components: The satellite, the launch vehicle, the launch pad, ground tracking and command centers and a satellite and launch vehicle information center. These five systems are mutually supportive during the R&D and launch phases, forming one large system. This large system involves many scientific and technological disciplines, for example rocket technology, radio technology, automatic control technology, astrophysics, space materials, etc.

In 1968, with the deep concern of the party Central Committee, China established its Institute of Astronautics. Its chief mission is to draft the programs for the development of space technology, to be responsible for the design of all vehicles, research and production, to conduct the research and application of space technical sciences and to handle foreign [technical] exchanges and cooperation. Two years after the establishment of the Institute of Astronautics, China launched its first satellite.

Early Broadcast Satellite and Scientific Research Satellites

China's first satellite, the "East Is Red No 1," was an early broadcast satellite. Its chief function was to broadcast the song "East Is Red" to the world and at the same time to transmit the pertinent engineering parameters of the satellite's parts and instruments so that subsequent designs could be improved. The heart of the instrument package was the generator for the song "East Is Red," its principal components being six oscillators. Another important instrument was the telemeter, the task of which was to measure the satellite capsule's pressure and temperature and to monitor the electronic instruments, power source, and other parameters. The "East Is Red No 1" had a perigee of 439 kilometers and an apogee of 2,384 kilometers. The orbital plane was inclined 68.5 degrees from the equator and orbital time was 114 minutes. Its weight was 173 kilograms, compared to 83.6 kilograms for the first Soviet Sputnik and 8.22 kilograms for America's first satellite.

Less than a year later, China, in March 1971, launched a scientific research satellite. Its primary function was to measure the geomagnetic field, X-rays and cosmic rays and other space environmental parameters. An additional task was to test new satellite technology such as solar batteries and passive temperature controls, etc.

The external configuration was a multi-facet sphere on which were 20-odd solar battery panels. The satellite contained a round hermetically sealed compartment which housed a magnetometer and a radiation monitoring device, electronic instruments, a silver-zinc storage battery, etc. Between this compartment and the outer shell there were four small instrument compartments containing telemetry devices. Various space environmental monitoring devices were carried on the outer shell. The weight of the satellite was 221 kilograms; perigee was 226 kilometers and apogee was 1,826 kilometers. Orbital inclination was 69.9 and orbital time was 106 minutes. Satellite spin program began following separation from the rocket. As the solar battery collector panels fed a constant power supply to the storage battery, the generator for the telemetry remained functional until 1975.

More Advances: The Return of a Satellite

At this time research commenced on a returnable satellite to enable China's space effort to make new advances.

China's first successful returnable satellite was launched in November 1975. After she was aloft for a period of 3 days, according to plan, she was successfully returned to earth. At this point, China became the world's third country to master recovery technology.

In December 1976 and January 1978, China launched two recoverable satellites. With improved precision, gratifying results were obtained and a great quantity of information and imagery through remote sensing was collected, supplying all quarters of the people's economy with valuable data.

The launching of a recoverable satellite enhanced the status of China's space science and technology. The satellite carried remote sensing devices designed in China. The experiments involved three-axis stabilization attitude control technology, thermistor [?] temperature control technology, satellite recovery technology, heavy-thrust launch vehicle technology and launch and monitoring technology. The experiments will serve China's development of manned space-craft and space labs.

Launch Vehicles

Satellites cannot be launched without launch vehicles. For 10 years China has employed two types of launch vehicle. One has a maximum thrust of 100 tons. It has a two-stage liquid fuel engine. The other has a maximum thrust of 200 tons. It is a three-stage launch vehicle.

The launch vehicles have stabilization and attitude control systems. Ignition, shutdown and separation are all carried out according to a certain sequence and at pre-arranged velocities. The rocket carries instruments to measure flight velocity. When the rocket reaches these velocities, the instrument emits a radio signal which, after amplification, controls the motors' ignition, shutdown, separation and other operations.

The Future of China's Space Science

The satellite is a modern implement of production, a kind of advanced productive power. Satellites have already become indispensable implements for transportation and communications, posts and telecommunications, meteorology, science, culture, and other quarters of the people's economy. What developments will China's space effort undergo in the 1980's?

The development of satellite communications and the research and development and launching of synchronous communications satellites will transform China's backward posture as regards communications, especially in that it will be possible to resolve the communications problems in western China. The so-called synchronous satellite is a satellite which orbits at the same speed as the rotation of the earth. Synchronous satellites fly parallel to and some 36,000 kilometers above the equator, motionless, and can relay ground television and telephone signals.

Aboard the satellite a control system maintains the satellite in a stationary position. If the tug of the sun, earth or moon causes the satellite to move, the control system will return it to its original position. The technology that enables the satellite to maintain this fixed position is referred to as "fixed-point holding technology." Fixed-point margin of error is generally required to be approximately 1 degree. These satellites also carry solar batteries and microwave transmitters and their antennas.

China wants to develop satellite broadcasting--to research and develop a Chinese broadcast satellite for television transmissions. Broadcast satellites are also synchronous but the technical specs are more complex than those for communications satellites. They require a more powerful energy source, which is to say that they must carry solar panels with a large surface area. These panels are folded up inside the launch vehicle. As soon as the satellite is inserted into a synchronous orbit, the solar panels deploy and convert solar energy into electrical energy for the broadcast transmitter. Fixed-point accuracy requirements for a broadcast satellite are higher than those for a communications satellite, the current international standard being ± 0.1 to ± 0.05 degrees.

China is also preparing to develop satellite natural resources surveys, and to research, develop and launch such satellites. The use of these satellites for large-scale resource surveys of highlands and mountainous regions and for gathering information on earthquakes, currents, environmental pollution, forest fires and agriculture saves enormous amounts of manpower and material. Even more wonderful is the fact that satellites can also engage in archeological studies, finding cities buried beneath sands and earth. The natural resources survey satellites China plans to launch include those fitted with multi-spectroscopes and microwave and infrared remote sensors. The satellites would be in polar orbits or solar synchronous orbits. Polar orbits are perpendicular to the equator and pass over the North Pole and the South Pole. Solar synchronous orbits are orbits inclined 98 [sic] degrees from the equator which carry the satellite over a designated region at a fixed time each day.

China is also preparing to develop weather satellites to collect meteorological data over broad areas in an effort to improve weather forecasts. Today, China receives cloud charts from foreign meteorological satellites but some data (for example, wind velocity, temperature, etc.) are not as easily obtained. Therefore, researching and developing our own weather satellite is a must. These meteorological satellites also fly in a polar orbit or synchronous orbit.

Table 1. Previous Chinese Earth Satellite Launchings

Order of Satellite	Purpose	Principal On-board Instruments	Launch Date	Satellite Weight(kg)	Orbit Parameters			
					Perigee(km)	Apogee(km)	Inclination	Periodicity
No 1	To broadcast "East Is Red"	Music transmitter, remote sensors	4/24/70	173	439	2,384	68.5	114 mins.
No 2	Space environment survey	Survey instruments, remote sensors	3/3/71	221	266	1,826	69.9	106 "
No 3	Scientific research	Electronic instruments	7/26/75	1,200	186	464	69	91 "
No 4	Recovery experiment	Remote control instruments	11/26/75	1,900	173	483	63	91 "
No 5	Scientific research	Electronic instruments	12/26/75	1,200	183	387	69	90 "
No 6	Scientific research	Electronic instruments	8/30/76	1,200	--	--	--	--
No 7	Recovery experiment	Remote control instruments	12/7/76	1,900	167	489	59	91 "
No 8	"	"	1/26/78	1,900	159	482	57	91 "

CSO: 4008

BRIEFS

MARITIME SATELLITE NAVIGATION--The first batch of shipboard satellite navigation receivers to be developed by China has been put to use on ships making long voyages. Performance has been excellent. Satellite navigation is the latest in maritime navigational technology. China's shipboard satellite receivers have all-weather, world-wide capability. They resist interference, possess a high degree of accuracy, and are very stable. In May 1980, when China conducted its launch vehicle tests in the Pacific, these satellite navigation receivers played a vital role. Every survey ship, range instrumentation ship and recovery vessel on this long voyage was equipped with these receivers, assuring the successful completion of the monitoring and recovery missions of the fleet. This batch of shipboard satellite navigation receivers was the product of a joint effort by concerned industries, research units and factories. [Text] [Beijing RENMIN RIBAO in Chinese 30 Oct 80 p 1]

CSO: 4008

HEALTH MINISTER INSPECTS CONDITIONS IN TWO HEBEI COUNTIES

Beijing GUANGMING RIBAO in Chinese 1 Aug 80 p 1

[Reportage by reporters Zhang Xiluo [1728 6007 3157] and Fan You [3058 0642]: "Public Health Minister Goes to Rural Areas 'With a Light Pack'"]

[Text] Early in the morning on 17 July, Qian Xinzhong, minister of public health, together with Vice Minister Guo Ziheng, rode in a bakery truck to the rural areas of Hebei to investigate and study public health work. In early June, Minister Qian Xinghong had led a delegation on a visit to America lasting over 10 days, returning to Beijing on 2 July. Only half a month separated his return from abroad and his going down the countryside.

Since the beginning of this year, Minister Qian Xinzhong and vice ministers Wang Wei, Yang Shoushan, Huang Shuze, and Cui Yueli have, one after another, gone to the rural areas for investigation and study. After the two documents concerning agriculture were handed down by the central authorities, great changes occurred in the vast rural areas. With the new situation in public health work in the rural areas, Comrade Qian Xinzhong selected Baxian County and Gu'an County in Hebei Province as the places where he would take another look at how this work should be strengthened and improved.

After the smashing of the "gang of four," a question in dispute was whether to provide cooperative medical services. Qian Xinzhong on his first visit found that the broad masses of rural cadres and commune members welcomed cooperative medical services, but the question was whether, based on different economic conditions, different methods could be adopted, and not simply pursue free medical care. They held that in places where the collective economy base is fairly small and collective medical services cannot be provided, fees can be charged for seeing a doctor, thus insuring that there will be doctors and medicine in the rural areas and that if a peasant falls ill someone will care for him. But the "barefoot doctors" should not be disbanded. Baxian County and Gu'an County provide collective medical services suited to local conditions and in the spirit of seeking truth from facts, and these services are fairly flexible and diversified. In reducing the proportion of medical expenses, they pay a fair amount of attention to the collective welfare of the commune members who receive medical treatment, linking this with the individual's necessary burden of the cost. For some commune members, the cost is reduced by about 50 percent, for others it is reduced by less than 50 percent, and for still others the cost of the medical treatment is reduced but not the cost of the medicine. Only a tiny minority receives medical treatment completely gratis. After making on-the-spot observations and conversing with cadres and commune members, the minister and vice minister felt that the past practice of seeking at one stroke and one sidely to raise the rate of free medical treatment led to many cooperative medical stations "operating in the spring and fizzling out in the autumn," viz, in the second half of the year they had no money for expenses. Practice proves that wealth is not equally distributed in the rural areas throughout our country, and it won't do to rigidly line them up in tidy order.

Qian Xinzhong and his party praised Baxian County and Gu'an County for starting out from reality, with the spirit of seeking truth from facts, in providing cooperative medical services. At the same time, he raised the point that, as the economy of the rural areas develops and the life of the peasants improves, the demands made on medical treatment and hygiene increase, and cooperative medical services inevitably will not be able to stop at treating minor injuries and minor ailments. In production brigades where the economy is good, the cooperative medical services must accumulate some funds and use them to improve equipment, expand the number of medical services, and improve the treatment of "barefoot doctors," striving hard to motivate the "barefoot doctors" to study their profession intensively and improve their technical level continually.

Qian Xinzhong and his party found that Hebei Province has taken the training of "barefoot doctors" seriously and has tested them at regular intervals. After over 700 of the more than 900 "barefoot doctors" in Baxian County had passed their qualifications tests, Qian Xinzhong said: "The raising of the technical level of 'barefoot doctors' has an extremely large bearing on the consolidation and development of cooperative medical services. The entire country must strengthen the work of training and testing 'barefoot doctors.'" Both Qian Xinzhong and Guo Ziheng are leading cadres who know their business. They went to clinical examination rooms in the counties' hospitals and looked at their medical records, and they also conversed with medical and nursing personnel and with patients.

They noted that the two counties managed well nightsoil and water, thereby promoting higher foodgrain output. Qian Xinzhong told the commune and production brigade cadres that some places only look at nightsoil and water management as being the affair of public health departments. Your practice, he said, proves: Good management of drinking water insures that the peasants rarely fall ill and that the labor force is protected; good management of nightsoil helps the soil fertility to be high so that agriculture can increase its output. The management of drinking water and the management of nightsoil are two key questions in rural public health work, and everybody should get a good grip on them.

When Qian Xinzhong went into the countryside, he stayed at an ordinary hostel. The arrangements for the daily activities of those staying at the hostel were very strict, and after eating breakfast at 6:30 am they set out for work, frequently returning for their evening meal at 7 or 8 pm. For several days, the temperature was high, but 68-year-old Qian Xinzhong stood up to the scorching sun and braved the intense heat of summer. In the two counties, he visited the county-level medical and public health personnel, "barefoot doctors," and patients, gathering their ideas. Everybody was favorably impressed with the workstyle of the responsible person of the Ministry of Public Health in going down to the countryside "with a light pack" to investigate the new situation and solve new problems.

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LIFE SCIENCES

PLA HOSPITAL DEVISES PULMONARY BLOOD FLOW CHART

Beijing GUANGMING RIBAO in Chinese 1 Aug 80 p 1

[Article by Liu Anlong [0491 1344 7893], Shi Kungu [0670 3824 3768], and Xiang Chun [0686 2504]: "New Theoretical and Practical Breakthrough"]

[Text] Hospital 211 of the PLA Shenyang Units began in 1975 to do research work on a pulmonary blood flow chart. The Shanghai Chest Hospital, the Harbin Municipal Chronic Tracheitis Prevention and Treatment Research Institute, and the General Hospital of the Shenyang Units have vigorously cooperated with it in this research. After repeated experiments on animals and a great amount of clinical tests and verifications over the past few years, for the first time the theory of "pulse movement synthesis and fluctuation [dongjing mai zonghe budong 0520 7234 9115 4920 0678 3134 0520]," was put forward, and also, having been put into practice in clinics, it corrected the long-held concept of "simple part arterial blood flow [danchun jubu dongmai xuelu 0830 4783 1444 6752 0520 9115 5877 3177]," which led to new advances in the clinical use of the pulmonary blood flow chart.

The pulmonary blood flow chart is a supplemental diagnostic method for observing from outside the body the dynamics of the changes in pulmonary blood circulation. It possesses the merits of being simple and convenient, comparatively respectable, and comparatively sensitive, and does not entail harming or operating on the patient. The pulmonary blood flow chart was developed on the basis of studying the chest blood flow chart, the liver blood flow chart, and the limbs and trunk blood flow chart. Li Xizhen [2621 1585 5271], head physician of Hospital 211, conscientiously analyzed the Chinese and foreign blood flow charts currently in use, and boldly traced a blood flow chart for use in treating diseases in which the changes in pulmonary blood circulation are paramount. After 1,550 clinical examinations of pulmonary emphysema, lung and heart ailments, congenital heart disease, and rheumatic heart disease, he made a new breakthrough in theory and practice. For the shape of the curves on the pulmonary blood flow chart, he first of all drew them to reflect the synthetic changes in the blood capacity of the pulmonary artery and pumonary vein, clarified the principles by which each wave pattern is produced on the pulmonary blood flow chart, and put forward an objective basis for making an early diagnosis of pulmonary emphysema and of lung and heart ailments, for judging the degree of flow differentiation and the changes in pulmonary blood vessel obstruction caused by congenital heart disease, and for making an initial evaluation of the results of an operation. The scientific research achievement of this hopsital was reported on six separate occasions at specialized meetings at the national, provincial, and municipal level, and the hospital's technical materials have been published in five kinds of military and civilian medical journals.

From October of last year to May of this year, the General Hospital of the Shenyang Units has done a great number of clinical tests and verifications and a great number of pre- and post-operative comparisons of the wave patterns on the pulmonary blood flow chart; these have all confirmed this scientific research achivement. The Medical Science and Technology Committee of the Shenyang Units recently convened a meeting at Hospital 211 to appraise the scientific research achievement of the pulmonary blood flow chart, and it held that the hospital possesses in the chart something of advanced scientific and pratical value. It also suggested that the chart be put into widespread use in qualified hospitals of the Shenyang Units.

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CSO: 4008

BENEFITS, LIMITATIONS OF PLACENTAL GLOBULIN EXPLAINED

Beijing GUANGMING RIBAO in Chinese 16 Aug 80 p 1

[Article by Xu Jiuwu [1776 0046 2976]: "Placental Globulin Cannot Be Used Indiscriminately"]

[Text] In recent years, placental globulin has entered our daily lives in an increasingly deeper and more widespread way. It has become a drug that is familiar to almost every person and every family. Not a few persons are constantly worried and run around just wanting to buy it. There is indeed a lot of talk about its benefits--from curing hepatitis, measles, etc., to relieving fever and colds. It has simply become a "cure-all" guaranteed for the treatment of hundreds of diseases. With regard to the way to use it, much confusion exists. Some people even treat it as a "nutritional supplement" and believe it can make the heart and body stronger; the more injections of it, the better.... What really is the effect of placental globulin? What is the correct way to use it? For the purpose of clearing up these questions, this reporter recently paid a visit to Prof Zhu Futang [6175 4395 2768], director of the Beijing Children's Hospital, and Prof Xie Shaowen [6200 1421 2429], of the Institute of Basic Medicine Research, Chinese Academy of Medical Sciences.

Although many persons have used placental globulin, not very many know how the drug is made and prepared, or what its active ingredients are. Professor Xie Shaowen answered these questions first. He said: "Regarding the creation of placental globulin, director Zhu Futang should have some credit. It was in 1933, during a period when Professor Zhu was out of the country to do research, that he and Professor Maikang [7796 1660, transliteration] of Harvard University obtained a globulin extract from the serum of a pregnant woman's placenta. At first they were considering using it to prevent diphtheria and scarlet fever. Later, it was gradually applied to other aspects such as preventing measles. Its active element is gamma globulin. At present, the commonly used globulin products include, aside from placental globulin, the gamma globulin made from human serum. These two drugs have the same active element. When the two are compared, the effective element content of the human serum gamma globulin is higher and more efficacious, but since it is limited by the source of human blood, the cost is high; therefore, it is still not extensively applied in medical treatment. At present, placental globulin continues to be applied more extensively [than gamma globulin].

As everyone knows, the human body has two defensive immune systems--i.e., cell immunity and body fluid immunity. Gamma globulin belongs to the product of body fluid immunity. Each one of us is regularly being attacked by various kinds of pathogenetic micro-organisms. From the viewpoint of immunology, all of these pathogenetic micro-organisms are antigens. After they have invaded the human body, they will stimulate the lymph system's B cells to produce antibodies. The antibody can neutralize the pathogenetic action of the antigen and allow man to acquire a certain ability to defend against certain infectious diseases. The antibody is a group of immunoglobulins of specific functions; they are divided into alpha, beta and gamma globulins, of which gamma globulin contains the highest amount of antibodies, and exist mainly in the blood and the body fluids of the human body. For this reason, when we inject the gamma globulin extracted from the serum of a pregnant woman's placenta into the body of another person, the number of antibodies in that person's body will increase and his ability to resist the invasion of pathogenetic germs will be stronger. Professor Zhu Futang told the reporters that at present the scope of application of placental globulin is mainly for hepatitis A, measles, and congenital immunodeficiency. It is also somewhat effective in emergency treatment of critical stage chickenpox and severe bacterial infections. In daily living, we often see people abusive the use of placental globulin in any old way, for tonsillitis, pneumonia, or even osteomalacia, which has nothing whatever to do with it. There are also some people who treat it as a "nutritional drug," saying that it "has hundreds of benefits and not a single harmful effect." They take it once a week, continuously. With this situation in mind, Professor Zhu emphasized: "Placental globulin provides passive immunity and has only limited applications. For example, it may prevent hepatitis but it cannot cure hepatitis. It has an obvious effect against hepatitis A, but it has no action on hepatitis B. To say that placental globulin can cure hundreds of diseases is totally without scientific basis. To use it blindly is first of all a serious waste, creating an artificial shortage of the drug and causing it not to be available for those who really need it. At the same time, it also affects the health of the user, because repeated use may cause hypersensitive reactions, including nettle rash [urticaria], laryngeal edema, etc. In severe cases, allergic shock may even occur.

Professor Zhu Futang then introduced in detail the method of using placental globulin and the important items to be taken into consideration, based upon his own experience of many years of medical practice. He said that the immune period of placental globulin lasts about 4 to 8 weeks. When it is used to prevent hepatitis and measles, one injection is generally sufficient, and if there is no continuous contact with patients, no more is needed. If there is continuous contact with patients, one more injection may be administered a month later. If this drug is injected into a pregnant woman with O-type blood, it may induce hemolysis in the newborn; extreme caution therefore is necessary. Babies less than 1 year of age are in an important period of gamme globulin synthesis within the body; repeated use of the drug may suppress the production of the body's own gamma globulin. Unless it is absolutely necessary, therefore, it is best not to inject the drug.

In conclusion, Professor Zhu also suggested that the biological product departments must be very strict in producing the drug. There should be a physical examination of the pregnant woman [whose placenta is used to produce the drug], including her history of illness, so as to prevent the use of placenta containing other pathogens in the manufacture of the drug, as this could damage the health of the people.

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CSO: 4008

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CSO: 4008

AUTHOR: WANG Xingyeh [3769 5281 2814]

ORG: None

TITLE: "Heat Insulation and Aviation"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 10, Oct 80 pp 15-16

ABSTRACT: A modern aircraft is subject to many undesirable heat sources which include: aerodynamic heating, heat radiation and conduction from engines, heat generation from electric and electronic equipment, and heat dissipated through high temperature air pipes from the compressor. In order to maintain normal temperature in the flight cabin and to protect critical compoenets and equipment from overheating, insulation materials must be installed at key locations on the aircraft. Due to the wide range of applications, a variety of heat insulation materials are being used; they include: polyurethene foam, silicon or silicate compounds, composite metallic foil and fiberglas materials, inorganic fibers such as quartz fiber, ceramic fiber, etc. Overheating is an even more critical problem in the operation of the Space Shuttle, and scientists are currently engaged in intensive research to develop more effective heat insulation materials.

AUTHOR: CUI Changqi [1508 7022 3823]

ORG: None

TITLE: "Air Defense Command System"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 10, Oct 80 pp 22-23

ABSTRACT: To meet the demands of modern warfare involving ballistic missiles and nuclear weapons, it is essential that the operations of command, control, intelligence and communication of an air defense system be automated. Such a system may be established either on a national basis or on a regional basis. In this article, the capabilities of an automated command and control system are introduced and the functions of each subsystem are described in detail. The subsystems include: 1) automatic recording subsystem for recording radar information; 2) data processing subsystem for analyzing and presenting important information to the combat commander; 3) terminal display subsystem; and 4) data communication network.

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CSO: 4009

Oceanology

AUTHOR: ZHANG Binggen [1728 3521 2704]

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TITLE: "On the Oscillation of the Solutions for Second-Order Functional Differential Equations"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 1, 15 Mar 80 pp 1-8

TEXT OF ENGLISH ABSTRACT: In this paper we consider oscillation and nonoscillation of the solutions for the more general second-order functional differential equations. Some sufficient conditions which keep all the solutions oscillating were obtained.

Here is an example of an equation:

$$y''(t) + f(t), y(t), y(g(t)), y'(t), y'(h(t)) = 0, \quad t \geq A \geq 0 \qquad (5)$$

where $g(t) \to \infty$, $h(t) \to \infty$ as $t \to \infty$.

Theorem 1. In addition to the conditions on the continuity and existence and uniqueness of the solution, we suppose that the following conditions are also satisfied:

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(i) $f(t, u, v, w, z)$ have the same sign as u, v, if u, v have the same sign;

(ii) for every positive monotonu nondecreasing function or negative nonincreasing function, the following equation

$\int^{A} f(t, y(t), y(g(t)), y'(h(t)))dt = \infty \cdot \text{sgn}\,y$ is correct. Then all the solutions of equation (5) oscillate.

The theorems contain partial results of the articles by Kung and Chiou. The necessary and sufficient conditions in which equation (5) has a nonoscillatory bounded solution are established in this paper. This is theorem 3.

In the present paper we prove five theorems which contain some results of foreign articles.

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TITLE: "On the Determination of Elevation Datum"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 1, 15 Mar 80 pp 15-25

TEXT OF ENGLISH ABSTRACT: The purpose of this paper is to deal with the principle and method of computing mean sea level so as to determine the reference plane (elevation datum) for the local geodetic leveling in China. With the sea level records for 19 years running at a given tide gauge station treated as time series, the mean sea level has been computed by the straight average of 24-hour observations every day and by X, Z, N, G filters. The analysis of the results shows that the accuracy of computation may attain 1 mm, which basically meets the requirement for the local geodetic leveling.

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TITLE: "Numerical Modeling of the Circulation and Pollutant Dispersion in Jiaozhou Bay. I. Numerical Computation of Tidal Currents"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 1, 15 Mar 80 pp 26-55

TEXT OF ENGLISH ABSTRACT: This paper deals with numerical computation of the tidal currents in Jiaozhou Bay, the first part of a numerical study of both the circulation and the pollutant dispersion there. A two-dimensional nonlinear model is used. Only two tidal constituents, M_2 and S_2, are being taken into account, their oscillation at the bay mouth taken as input data for computation. The time-step of 60 seconds and the grid-step of 500 m are reasonably chosen. The computation is carried out on an IRIS-60 computer. The comparison between simulation and field observation exhibits excellent agreement, suggesting that the model employed here is satisfactory enough to serve our purposes. From the

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computations we can come to the following conclusions:

1. In the residual current field of the bay, there exist nine gyres and a "semi-gyre," six of them, including the "semi-gyre," being cyclonic, and the other four anticyclonic. Only three gyres and the "semi-gyre" are remarkable.

The maximum speed of the residual current, occurring at the north end of the bay mouth, is about 21 cm/sec.

2. The tidal currents orientate outgoing directions throughout the bay during ebb, while during flood they behave in a more complicated way due to the existence of gyres. During the period of tide change, tidal currents exhibit a pattern of "∞" or "8" in the entrance part and near the boundaries, while in the open area they show a simple counterclockwise or clockwise rotation pattern.

The maximum speed of flooding currents, occurring at the north end of the bay mouth, is 120 cm/sec, and the maximum speed of ebbing currents, appearing west of Tuandao, 77 cm/sec.

3. The cotidal chart indicates that only seven minutes after the occurrence of high water at the bay mouth it takes place in the west shallow water area. From

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the corange lines it can be concluded that the maximum tidal range, 23 cm higher than the tidal range at the bay mouth, occurs at the northeast end of the bay.

4. The numerical computations suggest that the nonlinear terms seem to be of less importance to the change in tidal level of Jiaozhou Bay. Nevertheless, the nonlinear equations should be used because nonlinear terms have a great influence on the residual currents which are of significance to our study.

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TITLE: "The Chemical Forms of Zinc and Its Distribution in the Northeast Jiaozhou Bay"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 1, 15 Mar 80 pp 64-78

TEXT OF ENGLISH ABSTRACT: The chemical forms of zinc and its distribution in the surface water of northeast Jiaozhou Bay (25 stations) have been studied. The ASV method and spectrophotometry with dithizone extraction were employed in untreated and treated seawater to identify forms of zinc in the seawater. We suggest that zinc in seawater can be divided into five forms by the following ways:

Particulate zinc (Zn_P). One liter seawater was filtrated through a membrane filter. The remains on the filter were digested in a mixture of HNO_3 and $HClO_4$, and then the content of particulate zinc was obtained by ASV.

Zn_{ASV} (labile zinc plus ionic zinc). They were determined by the ASV method

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directly.

Zn_{H2Dz} represents weak bound zinc (Zn_W) plus Zn_{ASV}. It was obtained by spectrophotometry with dithizone extraction directly.

Zn_{ASV} plus Zn_W and bound zinc (Zn_B) is the total soluble zinc (Zn_{TS}). The water sample was digested with HNO_3 and heated until boiling, and the Zn_{TS} was obtained by spectrophotometry.

$$Zn_W = Zn_{H2Dz} - Zn_{ASV}$$
$$Zn_B = Zn_{TS} - Zn_{H2Dz}$$
$$\Sigma Zn = Zn_{TS} + Zn_P$$

Results show high values near the coast area. The ΣZn mean value is 20.7 $\mu g/L$ (6.9 - 39.6 $\mu g/L$); Zn_P 2.70 $\mu g/L$ (0.4 - 6.5 $\mu g/L$), $Zn_P/\Sigma Zn = 13.0\%$; Zn_{ASV} 4.13 $\mu g/L$ (1.7 - 9.6 $\mu g/L$), $Zn_{ASV}/\Sigma Zn = 20.0\%$; Zn_W 5.49 $\mu g/L$ (1.3 - 19.6 $\mu g/L$), $Zn_W/\Sigma Zn = 26.5\%$; Zn_B = 8.42 $\mu g/L$ (1.47 - 20.3 $\mu g/L$), $Zn_B/\Sigma Zn = 40.7\%$; Zn_{TS} 18.0 $\mu g/L$ (5.3 - 34.5 $\mu g/L$), $Zn_{TS}/\Sigma Zn = 87.0\%$. The results show that bound zinc is the main form of zinc in the water of northeast Jiaozhou Bay, its content being about half of the total soluble zine ($Zn_B/Zn_{TS} = 46.7\%$), which agrees with Fukai's results.

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TITLE: "The Chemical Forms and Distribution of Lead in the Northeast Jiaozhou Bay"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 1, 15 Mar 80 pp 79-89

TEXT OF ENGLISH ABSTRACT: The chemical forms and distribution of lead in the surface water of northeast Jiaozhou Bay (24 stations) have been studied. The ASV method was employed to estimate the chemical forms of lead in both untreated and treated seawater. The lead can be divided into five forms which were Pb_{ASV} (labile lead plus ionic lead), weakly bound lead (Pb_{WB}), bound lead (Pb_B), particulate lead (Pb_P), total soluble lead (Pb_{TS}) and total lead ($\Sigma Pb = Pb_{TS} + Pb_P$).

The results showed high values near coastal areas. The mean ΣPb was $4.0 \mu g/L$ ($2.0 - 6.7 \mu g/L$); Pb_P $1.2 \mu g/L$ ($0.4 - 2.7 \mu g/L$), $Pb_P/\Sigma Pb = 30\%$;

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Pb_{ASV} $0.37 \mu g/L$ ($0.19 - 0.80 \mu g/L$), $Pb_{ASV}/\Sigma Pb = 9\%$; Pb_{WB} $1.1 \mu g/L$ ($0.23 - 2.70 \mu g/L$), $Pb_{WB}/\Sigma Pb = 26\%$; Pb_B $1.4 \mu g/L$ ($0.4 - 3.8 \mu g/L$), $Pb_B/\Sigma Pb = 35\%$. The data indicated that Pb_B and Pb_P were the main forms in the seawater. The relationships between some forms of lead and values of Cl% (PH, COD) are discussed also.

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TITLE: "A Preliminary Observation on the Reversal of Sides of Cleisthenes herzensteini (Schmidt)"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 1, 15 Mar 80 pp 90-94

TEXT OF ENGLISH ABSTRACT: In March, 1979, a side-reversed Cleisthenes herzenteini was captured from Shidao fishing grounds of the Yellow Sea. It is a three-year female, measuring 18.3 cm. Its eyes are deviated to the left side, and the color of this side of the body is yellowish brown while the other side is white.

The main features of the fish, such as the indicators of the countable characteristics and the proportional measurements of every part of the body, and the optic chiasma, are all the same as those of the normal ones. Because of the reversal of eyes and the changing of living sides of the body, the shape of the mouth and the morphology of the pectoral fins and scales are also reversed.

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The position of the alimentary system in the body cavity is different from that of other flounders, the liver located on the right side of the body and the stomach and intestine deflected to the left side.

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Shipbuilding

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TITLE: "Hunters of the Sea: Submarine Chasers"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 5, 20 Aug 80 pp 2-3

ABSTRACT: Submarine chasers are light antisubmarine craft which work in near-ocean areas (within 200 mn). They range in displacement from 100 to 900 tons and have speeds of 18-35 knots (up to 60 knots for hydrofoils). Their weapons generally include antisubmarine missiles, antisubmarine torpedos, automatic cannon and depth charges; they use radar, sonar and radio equipment. A Soviet Grisha class sub chaser, a US 120-ton aluminum alloy hydrofoil sub chaser and a Canadian 235-ton sub chaser are briefly described. The general characteristics of such boats are: small size and high maneuverability, powerful antisubmarine capabilities, and multitask capabilities (patrol, observation, communications and the like). Future developments are likely to include: use of small towed variable-depth sonar equipment instead of ship-mounted units; increasing use of hydrofoils, surface-effect craft (such as the British VT-2), and helicopters (such as on the US "PHM" project); and use of rocket-assisted self-guiding antisubmarine torpedos, which will increase range and rapidity of response. An example is the US ASROC system.

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TITLE: "A Brief Description of Hull Construction"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 5, 20 Aug 80 pp 4-6

ABSTRACT: The ship hull assembly process consists of the following stages: (1) assembly of machined parts into assemblies, (2) combining of parts and assemblies into subsections and full sections, and (3) assembly of subsections or full sections into the complete hull. The details of assembly of the various subsections (bottom, sides, deck and compartments) are described, starting with plates which are shaped and the positions of strengthening ribs and cross members marked on them, and followed by installation of these members and of interior plating. Assembly of the entire ship from the subsections and sections can be done as follows: (1) simple joining of completed sections; (2) the "tower" method, in which assembly begins with a bottom section slightly aft of amidships and continues upwards and toward the two ends; (3) the "island" method, in which several sections of a ship are built by the "tower" method in the building slip and ultimately joined; and (4) the mixed assembly method, in which utilization of building slip area is improved by building one section of the subsequent ship while the first ship is being built, then sliding this section down after the first ship is launched and adding the other sections of that ship, at the same time beginning work on a section of the next ship.

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TITLE: "Antiship Guided Missiles Past and Present"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 5, 20 Aug 80 pp 7-9

ABSTRACT: After the Second World War, the United States relied primarily on carrier aviation for its antiship capability, while the Soviet Union developed antiship missiles. The sinking of the destroyer Eilat by a Styx missile in 1967 awakened the US and its allies to the importance of antiship missiles, and development programs began. Not only the US, but France, West Germany, Italy and Israel developed such missiles, although the Soviet Union is far ahead in variety and number deployed. Short range missiles (4-40 km) include the Soviet SS-N-2, SS-N-7 and SS-N-11, the French MM-38 and AM-38, and some West German and Italian models. Their range is so short that they expose the launching ship to enemy action. Medium range missiles (60-200 km) include the Soviet SS-N-9, the French MM-40, a joint French-Italian missile and the US Harpoon. These have a striking capability beyond the line of sight. Long-range missiles (over 500 km) include the Soviet SS-N-3 and SS-N-12 and the US Tomahawk. These have effective ranges of up to 1,000 km. Midcourse guidance may be by aircraft or satellite. The characteristics of newer missiles include: multiplicity of uses, high accuracy and explosive power, good penetration capability and high maneuverability. The characteristics of the SS-N-2, the MM-38 and the Harpoon are given in a table.

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TITLE: "A New Weapon of the Future: The Particle Beam Weapon"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 5, 20 Aug 80 pp 12-14

ABSTRACT: The US and the Soviet Union are pursuing development of particle beam weapons, which direct a high energy beam of protons, electrons or neutrons against a target. In addition to scientific uses, these devices can be employed in antimissile and antisatellite systems. The CEP of Soviet missiles is expected to decrease to 46 m by 1990, giving a 20 megaton warhead a kill probability of 97 percent; 100 warheads could be put on each missile, so that 300 Soviet missiles could wipe out 900 US missiles even if each had 23 concealed firing positions. Hence the importance of new, powerful ballistic missile defense weapons. Currently the US Navy is actively pursuing development of a particle beam system which might weigh 100 tons, develop pulses at 500 MV with currents of 10 kA, with pulse width of 10 ns, and have a killing range of between 4.5 and 9.5 km. The journal AVIATION WEEK reported in October 1979 that the Soviets had made a major breakthrough, using a beam to destroy a ground-based military target, and presented some pieces of evidence that major Soviet scientists were working on the program. A particle beam program has four major aspects: production and acceleration of the beam; the

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power supply system; propagation of the beam through the atmosphere; and the kill mechanism. The beams are subject to attenuation by the atmosphere and distortion by the earth's magnetic field. The technology may be considered to be still in its early stages. Submarine-based ICBM's are likely to be the main strategic weapon in the 21st century.

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TITLE: "Lateral Propulsion Units"

SOURCE: Beijing JIANCHUAN ZHISHI [KNOWLEDGE OF SHIPS] in Chinese No 5, 20 Aug 80 pp 28-29

ABSTRACT: Because the rudder technique of turning is ineffective in a short radius, small river ships may take several minutes to turn around, while it may take a large tanker as much as an hour. Maneuverability can be greatly increased by the use of lateral propulsion units installed in cylindrical passages through the hull of a ship. The propulsion unit may be of the jet type, screw type or straight-vane propeller type. Other units, mounted on vertical shafts, protrude below the bottom of the ship and may be turned in any desired direction. These highly maneuverable units are important in dynamic ship positioning, which is used in such activities as seabed mining and offshore well drilling. In this system, positioning signals from satellites or radio networks are received by the ship and interpreted by onboard computers which give automatic position correction directions to the small maneuvering engines under the hull of the ship.

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